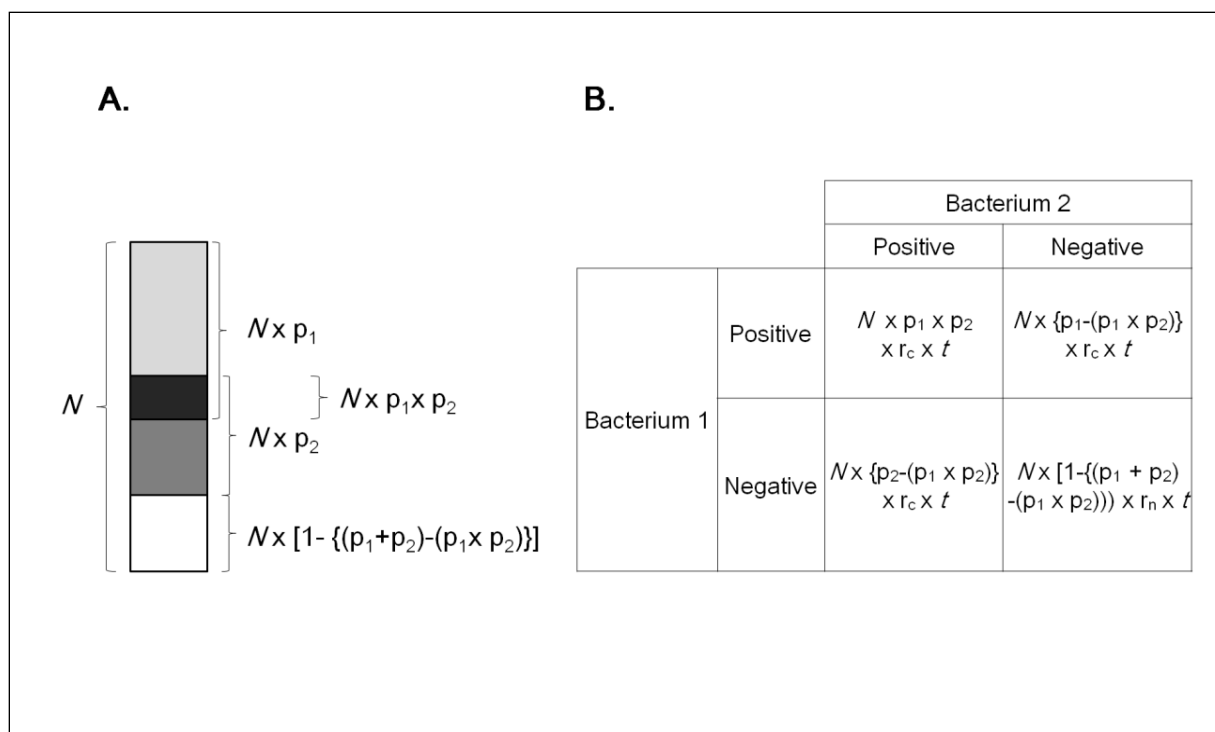


Nasopharyngeal Bacterial Interactions in Children

Technical Appendix

Figure. Number of children by bacterial colonization status in a stationary population (A) and cases enrolled during a specified time period (B).



N : the population size

p_1 : the prevalence of bacterium 1 colonization

p_2 : the prevalence of bacterium 2 colonization

r_c : the risk of enrollment among colonization-positive children

r_n : the risk of enrollment among colonization-negative children

t : a study period

Suppose the colonization of bacterium 1 and of bacterium 2 occur independently in the population.

The odds ratio between bacterium 1 and bacterium 2 in the population (OR_{pop}) will be

$$\begin{aligned} OR_{pop} &= \frac{N \times p_1 \times p_2 \times N \times [1 - \{(p_1 + p_2) - (p_1 \times p_2)\}]}{N \times \{p_1 - (p_1 \times p_2)\} \times N \times \{p_2 - (p_1 \times p_2)\}} \\ &= \frac{p_1 \times p_2 - (p_1 \times p_2) \times (p_1 + p_2) - (p_1 \times p_2)^2}{p_1 \times p_2 - (p_1 \times p_2) \times (p_1 + p_2) - (p_1 \times p_2)^2} \\ &= 1 \end{aligned}$$

The OR between bacterium 1 and bacterium 2 in the enrolled cases will be

$$\begin{aligned}
 OR_{\text{case}} &= OR_{\text{pop}} \times \frac{r_c \times t \times r_n \times t}{r_c \times t \times r_c \times t} \\
 &= OR_{\text{pop}} \times \frac{r_n}{r_c} \\
 &= \frac{r_n}{r_c}
 \end{aligned}$$

which is the reciprocal of risk ratio for enrollment (= developing the disease; r_c/r_n).